

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION

(PCT Rule 66)

To:
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Date of Mailing
(day/month/year) **20 JUL 2004**

Applicant's or agent's file reference

IMPJ-0017 WO

REPLY DUE

within 2 months/days from
the above date of mailing

International application No.

PCT/US03/21677

International filing date (day/month/year)

09 July 2003 (09.07.2003)

Priority date (day/month/year)

09 July 2002 (09.07.2002)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): G11C 11/34 and US Cl.: 365/185.19

Applicant

IMPINJ, INC.

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2 (a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension. See rule 66.2(d).~~

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 *bis*.
For an informal communication with the examiner, see Rule 66.6

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 09 November 2004 (09.11.2004)

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WRITTEN OPINION

International application No.

PCT/US03/21677

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☒ the description:
 pages 1-43, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☒ the claims:
 pages 44-54, as originally filed
 pages NONE, as amended (together with any statement) under Article 19
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☒ the drawings:
 pages 1-40, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☐ the sequence listing part of the description:
 pages NONE, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed."

WRITTEN OPINION

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V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

| | | |
|-------------------------------|---|-----|
| Novelty (N) | Claims <u>Please See Continuation Sheet</u> | YES |
| | Claims <u>Please See Continuation Sheet</u> | NO |
| Inventive Step (IS) | Claims <u>Please See Continuation Sheet</u> | YES |
| | Claims <u>Please See Continuation Sheet</u> | NO |
| Industrial Applicability (IA) | Claims <u>Please See Continuation Sheet</u> | YES |
| | Claims <u>Please See Continuation Sheet</u> | NO |

2. CITATIONS AND EXPLANATIONS
Please See Continuation Sheet

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VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claim 22 is objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof:
Claim 22 recites the limitation "said first well" and "said second well". There is insufficient antecedent basis for this limitation in the claim.

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VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

The drawings are objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 7 because: reference character "84" (fig. 21) has been used to designate both "channel stop" and "n⁺ region". The drawings fail to show "88" (gate oxide layer) as described in the specification. The disclosure is objected to because of the following informalities: page 33, paragraph 00048: change "FIGS. 120-53" to --FIGS. 20-53--. Appropriate correction is required.

Claims 18, 19, 24, 26, 40, 46 objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claims 18, 19, 24, 26, 40, 46 indefinite for the following reason(s):

Claims 18 and 19 are objected to because of the following informalities:

Claim 18 is identical to claim 19;

Claims 20, 22 and 24 - 27 are dependent of claim 18;

Claims 21 and 23 are dependent of claim 19.

Suggest to cancel claim 19 and change claims 21 and 23 being dependent of claim 18.

Appropriate correction is required.

Claim 24 and 26 are objected to because of the following informalities: According to the drawings, drain and source regions are not disposed within a second n- doped well regions of the substrate.

Claims 40 and 46 are objected to because of the following informalities: According to the drawings, n⁺ region is not disposed in a same n- doped with first and second p⁺ regions.

Appropriate correction is required.

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

V.1. Reasoned Statements:

The opinion as to Novelty was positive (Yes) with respect to claims 21,23,28,39-41,45,46,49-51,55,56,74

The opinion as to Novelty was negative (No) with respect to claims 1-20,22,24-27,29-38,42-44,47-48,52-54,57-73,75-84

The opinion as to Inventive Step was positive (Yes) with respect to claims 21,23,28,39-41,45,46,49-51,55,56,74

The opinion as to Inventive Step was negative(NO) with respect to claims 1-20,22,24-27,29-38,42-44,47,48,52-54,57-73,75-84

The opinion as to Industrial Applicability was positive (YES) with respect to claims 1-84

The opinion as to Industrial Applicability was negative(NO) with respect to claims NONE

V. 2. Citations and Explanations:

Claims 1-7, 9, and 12 lack novelty under PCT Article 33(2) as being anticipated by Chang (US 5,687,118).

Regarding claims 1 and 9, Chang discloses a floating gate semiconductor device comprising: a p type source region (fig.1, 14); a p type drain region (fig. 1, 16); a channel (fig. 1, 12) disposed between said source region and said drain region; an insulator (fig. 1, 124) disposed adjacent said channel; and a floating gate (fig. 1, 22) disposed adjacent said insulator and electrically insulated from the channel by the insulator.

Regarding claim 2, Chang discloses drain region and said source region are disposed in an n type region (fig. 1, 18) of a semiconductor substrate.

Regarding claim 3, Chang discloses n type region is an n well disposed in a p type semiconductor substrate (fig. 1, 20).

Regarding claims 4 and 12, Chang discloses the p type source region and the p type drain region are p+ doped (fig. 1, 14 and 16).

Regarding claim 5, Chang discloses the p type semiconductor substrate is p- doped (fig. 1, 20).

Regarding claim 6, Chang discloses the n well is n- doped (fig. 1, 18).

Regarding claim 7, Chang discloses the floating gate (fig. 1, 22 and fig. 10, 116) comprises polysilicon (col. 11, lines 40-45).

Claims 16, 29, and 57 lack novelty under PCT Article 33(2) as being anticipated by Pan et al. (US 5,650,346). Pan discloses a floating gate semiconductor device comprising: a p type source region (fig.3, 57); a p type drain region (fig. 3, 58); a channel disposed between said source region and the drain region; an insulator (fig. 3, 12) disposed adjacent the channel; and a floating gate (fig. 4, 70; col.4, lines 59-60) disposed adjacent the insulator and electrically insulated from the channel by the insulator (fig. 3, 12); and an n type tunneling region (figs.3 & 4, 52), the floating gate (fig. 4, 70) extending over at least a portion of said tunneling region and electrically insulated therefrom by an insulator.

Claims 8, 10,11, 13-15 lack an inventive step under PCT Article 33(3) as being obvious over Chang (US Patent No. 5,687,118).

Regarding claims 8 and 15, Chang discloses the claimed invention of claim 1 except for a first electrical contact electrically coupled to said drain region and a second electrical contact electrically coupled to said source region. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the electrical contact electrically coupled to the source and drain of the PMOS, in order to apply voltage to the source and drain for any particular operation.

Regarding claim 10, Chang discloses the claimed invention of claim 9 except for the drain region and source region are formed of deposited film. However this limitation is taken to be a product by process limitation, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair.

Regarding claims 11, 13 and 14, Chang discloses the claimed invention of claim 9 except for the channel comprising p type epitaxially grown silicon; floating gate comprising a layer of deposited n type amorphous silicon which has been recrystallized; and

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

floating gate comprising a layer of deposited p type amorphous silicon which has been recrystallized.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the channel comprising p type epitaxially grown silicon; floating gate comprising a layer of deposited n type amorphous silicon which has been recrystallized; and floating gate comprising a layer of deposited p type amorphous silicon which has been recrystallized for Chang's device, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use.

Claims 17-20, 22, 24-27, 30, 37-38, 42-44, 47-48, 52-54, 65-74 lack an inventive step under PCT Article 33(3) as being obvious over Pan et al. (US 5,650,346).

Regarding claims 17, Pan disclose the claimed invention of claim 16 except for a first electrical contact electrically coupled to said drain region and a second electrical contact electrically coupled to said source region and third electrical contact coupled to the tunneling region. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the electrical contact electrically coupled to the source and drain and tunneling region of the MOSFET, in order to apply voltage to the source and drain for any particular operation and to connect to the other part of the device (figs. 6A - 6; col. 1, lines 20-36).

Regarding claims 18 and 19, Pan disclose substrate is p- doped, the source region is p+ doped and the drain region is p+ doped (Fig. 3; col. 4, lines 38-39).

Regarding claims 20 and 24, Pan disclose the source and drain regions are disposed in a first n- doped well region of the substrate.

Regarding claim 22, Pan disclose the first well region and the second well region are separated from one another by a channel block (fig 3, 13).

Regarding claim 25, Pan disclose the claimed invention of claim 16, 18, 20 and 22 except for a first electrical contact electrically coupled to said drain region and a second electrical contact electrically coupled to said source region and third electrical contact coupled to the tunneling region. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the electrical contact electrically coupled to the source and drain and tunneling region of the MOSFET, in order to apply voltage to the source and drain for any particular operation and to connect to the other part of the device (figs. 6A - 6C col. 1, lines 20-36).

Regarding claims 26 and 27, Pan disclose the channel block comprises silicon oxide (col. 2, lines 60-61). Pan do not teach silicon oxide being deposited nor thermally grown. However this limitation is taken to be a product by process limitation, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair.

Regarding claims 37, 47, 65, 72-73, Pan disclose a floating gate device, comprising: a substrate (fig. 3, 10); an n- well (fig. 3, 40) disposed in the substrate; a first p+ region (fig. 3, 57) disposed in the n- well; a second p+ region (fig. 3, 58) disposed in the n- well; a floating gate formed of polycrystalline silicon (fig. 4, 64/79; col. 4, lines 53-61), the device including only a single layer of polycrystalline silicon (col. 4, line 18-20). Pan do not teach a first electrical contact coupled to the first p+ region; and a second electrical contact coupled to the second p+ region. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the electrical contact electrically coupled to the source and drain (first and second p+ regions) of the PMOS, in order to apply voltage to the source and drain for any particular operation.

Regarding claims 30-36, 38, 58-64, 71, and 75-84, Pan disclose the floating gate device comprising an n type tunneling region (figs. 3 & 4, 52).

Regarding claims 42, 43-44, 48 and 52-54, Pan disclose the claimed inventions of claims 37, 38 and 47 except for tunneling junction is implemented with a shorted nFET or pFET; and the floating gate is coupled to a MOSCAP. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide tunneling junction ibeing implemented with a shorted nFET or pFET; and the floating gate being coupled to a MOSCAP, since it has been held that constructing a formerly integral structure in various elements involves only routine skill in the art.

Claim 28 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest whether taken singularly or in combination, especially when these limitations are considered within the specific combination claimed: a floating gate device having an n+ region (fig. 14B, 57) disposed in a second n- well (fig. 14B, 56') and among other limitations as cited in claim 28.

Claims 21, 23, 39, 40-41, 45, 46, 49-51, 55, 56 and 74 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest all of limitations of the base claim and any intervening claims and because none of the prior art whether taken singularly or in combination, especially when these limitations are considered within the specific combination claimed, to teach: A floating gate device having a tunneling region disposed in an n+ doped region (fig. 14B, 57) within a second n- well (fig. 14B, 56') and among other limitations as cited in claims 21, 23, 39, 40-41, 45, 46, 49-51, 55, 56 and 74.

Claims 1-84 meet the criteria set out in PCT Article 33(4), because the claimed subject matter is useful in the industry.

----- NEW CITATIONS -----

US 5,687,118 A (CHANG) 11 November 1997 (11.11.1997), see Figures 1-13.